

5. REPRODUCTIVE ACTIVITY OF FOUR SPECIES OF FIELD-RATS IN CROP FIELDS AT LUDHIANA

For devising efficient control measures against any pest, the knowledge of its reproductive activity is necessary. As the rodents are poly-oestrous, there is no season to which breeding is strictly confined. Fertility may be low at certain times of the year; but if so, the cause is usually to be some external factor (Barnett & Ishwar Prakash 1975). The point of lowest reproductive activity indicates the break in the reproductive cycle and, thus, the most appropriate time for mounting control operations. Studies on the field-rats concerning this aspect were done and the information collected on the subject during the period of December 1970 to November 1972 is presented here.

MATERIALS AND METHODS

To obtain information on the reproductive activity of different species of field-rats, 'capture, mark, release and recapture method,' as described by Davis (1964) was employed. The traps were laid during December 1970 to November 1972 for a 10-day period in the first fortnight of each month in different crops at a 100 m distance from one another in a grid of 53 hectare cultivated area on the Ludhiana Farm of the Punjab Agricultural University. The traps were baited with a mixture of husked rice, pearl-millet and wheat. The trapped individuals were examined daily for sex, position of testes (scrotal or abdominal) in males and of vagina perforated or imperforated) in females. When the tests were abdominal, the black loose skin of the scrotum indicated that they were earlier scrotal. In the absence of black loose scrotal skin the abdominal condition of the testes indicated that the specimen was a subadult. In females, the

previous history of the animal indicated whether it was an adult or subadult. Presence of clear teats was taken to indicate lactating condition.

RESULTS AND DISCUSSION

The 1077 animals observed consisted of 841 *Rattus meltdada* (Gray), 161 *Tatera indica* (Hardwicke), 33 *Golunda ellioti* (Gray) and 42 *Bandicota bengalensis* (Gray). Their reproductive activity is discussed below specieswise.

1. ***Rattus meltdada*** (Gray). Scrotal males predominated throughout the year, except during November to February. Reproductively active females were present throughout the year, except during November and December and the lactating females were present throughout the year, except during December and January. Subadults were found during all the months. The peak lactating period was observed during July to September (Table 1). Similarly, Guraya & Gupta (1975) reported that this species did not breed in winter and the peak breeding activity was observed during July to October. Thus, from the above it may be concluded that this rat breeds throughout the year, except during the winter months.

2. ***Tatera indica*** (Hardwicke). None were found during December. During the remaining months, scrotal males were found to predominate, except during November. Reproductively active females were present throughout the year, except during May, October and November. The lactating females were present throughout the year, except during January to April, the peak being reached during May to October. Subadults were found

TABLE 1
REPRODUCTIVE STATUS OF *Rattus melstada* (GRAY) TRAPPED IN DIFFERENT MONTHS DURING DECEMBER 1970—NOVEMBER 1972

Month	Male					Female				Total
	Scrotal	Abdominal	Subadult	Total	Perforated	Lactating	Imperforated	Subadult	Total	
December	NA	5(83)	1(17)	6	NA	NA	NA	4(100)	4	
January	NA	13(100)	NA	13	3(30)	NA	NA	7(70)	10	
February	3(10)	27(90)	NA	30	17(55)	1(3)	NA	13(42)	31	
March	24(83)	4(14)	1(3)	29	15(71)	5(24)	1(5)	NA	21	
April	8(80)	NA	2(20)	10	5(83)	1(17)	NA	NA	6	
May	31(86)	1(3)	4(11)	36	7(47)	5(33)	1(7)	2(13)	15	
June	14(82)	NA	3(18)	17	5(42)	4(33)	NA	3(25)	12	
July	95(97)	NA	3(3)	98	9(15)	48(80)	NA	3(5)	60	
August	66(94)	NA	4(6)	70	10(17)	42(71)	NA	7(12)	59	
September	71(79)	NA	19(21)	90	8(7)	78(68)	7(6)	22(19)	115	
October	19(59)	7(22)	6(19)	32	5(15)	11(33)	1(3)	16(49)	33	
November	NA	15(71)	6(29)	21	NA	7(30)	3(13)	13(57)	23	
Total	331(73)	72(16)	49(11)	452	84(22)	202(52)	13(3)	90(23)	389	

Figures in the parentheses are per cent of animals falling in that category.
NA = No animal was found in this category.

MISCELLANEOUS NOTES

TABLE 2
 REPRODUCTIVE STATUS OF *Tatera indica* (HARDWICKE) TRAPPED IN DIFFERENT MONTHS DURING DECEMBER 1970—
 NOVEMBER 1972

Month	Male					Female				Total
	Scrotal	Abdominal	Subadult	Total	Per- forated	Lactating	Imper- forated	Sub- adult	Total	
December	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
January	1(50)	1(50)	NA	2	1(50)	NA	1(50)	NA	2	2
February	1(100)	NA	NA	1	2(67)	NA	NA	1(33)	3	3
March	8(80)	1(10)	1(10)	10	8(73)	NA	NA	3(27)	11	11
April	2(100)	NA	NA	2	1(100)	NA	NA	NA	1	1
May	2(100)	NA	NA	2	NA	1(50)	NA	1(50)	2	2
June	3(75)	1(25)	NA	4	1(50)	1(50)	NA	NA	2	2
July	9(100)	NA	NA	9	1(11)	4(44)	NA	4(45)	9	9
August	15(71)	1(5)	5(24)	21	1(8)	7(54)	NA	5(38)	13	13
September	17(85)	NA	3(15)	20	4(27)	9(60)	NA	2(13)	15	15
October	4(40)	3(30)	3(30)	10	NA	6(60)	1(10)	3(30)	10	10
November	NA	3(60)	2(40)	5	NA	1(14)	1(14)	5(71)	7	7
Total	62(72)	10(12)	14(16)	86	19(25)	29(39)	3(4)	24(32)	75	75

Figures in the parentheses are per cent of animals falling in that category.
 NA = No animal was found in this category.

TABLE 3
 REPRODUCTIVE STATUS OF *Golumda ellioti* (GRAY) TRAPPED IN DIFFERENT MONTHS DURING DECEMBER 1970—NOVEMBER 1972

Month	Male				Female				Total
	Scrotal	Abdominal	Subadult	Total Perforated	Lactating	Imperforated	Subadult	Total	
December	NA	NA	NA	NA	NA	NA	1(100)	1	
January	NA	NA	NA	NA	NA	NA	NA	NA	
February	2(67)	1(33)	NA	3	NA	NA	1(100)	1	
March	2(100)	NA	NA	2	1(100)	NA	NA	1	
April	NA	NA	NA	NA	NA	1	NA	1	
May	3(100)	NA	NA	3	NA	NA	1(100)	1	
June	2(100)	NA	NA	2	NA	1(100)	NA	1	
July	2(100)	NA	NA	2	1(100)	NA	NA	1	
August	3(100)	NA	NA	3	NA	NA	NA	NA	
September	2(50)	NA	2(50)	4	1(20)	1(20)	3(60)	5	
October	NA	NA	NA	NA	NA	NA	NA	NA	
November	NA	1(100)	NA	1	NA	NA	1(100)	1	
Total	16(80)	2(10)	2(10)	20	3(23)	3(23)	7(54)	13	

Figures in the parentheses are per cent of animals falling in that category.
 NA = No animal was found in this category.

MISCELLANEOUS NOTES

TABLE 4
 REPRODUCTIVE STATUS OF *Bandicota bengalensis* (GRAY) TRAPPED IN DIFFERENT MONTHS DURING DECEMBER 1970—
 NOVEMBER 1972

Month	Male				Female			
	Scrotal	Abdominal	Subadult	Total	Perforated	Lactating	Subadult	Total
December	NA	1(100)	NA	1	NA	NA	NA	NA
January	NA	NA	NA	NA	NA	NA	NA	NA
February	NA	1(50)	1(50)	2	NA	NA	NA	NA
March	3(100)	NA	NA	3	2(100)	NA	NA	2
April	3(100)	NA	NA	3	NA	NA	NA	NA
May	NA	NA	1(100)	1	NA	NA	NA	NA
June	NA	NA	1(100)	1	NA	NA	NA	NA
July	4(100)	NA	NA	4	NA	NA	1(100)	1
August	4(100)	NA	NA	4	1(33)	NA	2(67)	3
September	6(100)	NA	NA	6	1(13)	4(50)	3(37)	8
October	NA	NA	1(100)	1	NA	NA	1(100)	1
November	NA	NA	NA	NA	NA	NA	1(100)	1
Total	20(77)	2(8)	4(15)	26	4(25)	4(25)	8(50)	16

Figures in the parentheses are per cent of animals falling in that category.
 NA=No animal was found in this category.

throughout the year except during December, January, April and June (Table 2).

Singh (1961) found young ones of this species in fields with their mothers during March to May and again during October to December. Similarly, Prem Sagar & Bindra (1970) reported that the young ones of this rat were found during March to May and again during August to December. The present studies have revealed that this rat breeds throughout the year, although the peak breeding occurred during January to October. Similarly, Jain (1970) reported that *T. indica indica* Hardwicke bred throughout the year but the prevalence of pregnancy reached a peak during the monsoon. Male gerbilles also remained fecund during all seasons.

3. ***Golunda ellioti*** (Gray). Scrotal rats were present during February-March and during May to September. Unfortunately, owing to low population, no *G. ellioti* was observed during October and December-April. No female was seen during January, August and October. Reproductively active females were predominant during March, July and September. The lactating females were present during April, June and September. Subadults were found during February, May, September, November and December (Table 3). Owing to small number of individuals observed, it is difficult to draw any conclusions, but it appears that the breeding season in this species extends from March to September.

4. ***Bandicota bengalensis*** (Gray). Owing to a small number of individuals observed, it is

difficult to arrive at any conclusion (Table 4). According to Chakraborty (1975) this species breeds throughout the year.

The reduction in or lack of reproductive activity during winter has been reported in other species of rats and mice also (Mann & Bindra 1977, Sadleir 1969, Schiller 1956, Whitaker 1940), and the same has been attributed to short day length or low temperature under which conditions the testes may become abdominal and the spermatogenesis may stop.

SUMMARY

Studies on the reproductive activity were carried out during December 1970 to November 1972 in a grid of 53 ha. cultivated area on the Ludhiana Farm of the Punjab Agricultural University. These revealed that *Rattus meltda* (Gray) and *Tatera indica* (Hardwicke) bred throughout the year except during very cold months, when the reproductive activity was either drastically reduced or absent. In the case of *Golunda ellioti* (Gray) and *Bandicota bengalensis* (Gray), however, it is difficult to draw any conclusion owing to small number of animals observed, but it appears that the breeding season in these species also extends throughout the year with the exception of winter months.

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6. "THE BIRDS OF GOA"

The *Journal* for April 1976 (73:42-53) contains a paper "Birds of Goa" which reports on a collection of 150 specimens of 100 species. The total number of species collected and/or seen amounted to 154, which is probably less than half of the species occurring in the area, and there is very little that adds to the information already available.

The following points call for remarks:

1. In the opening section of the Systematic List, the subspecific names are said to be given only for the birds collected and examined, but in some instances this has been done though no specimen is listed, e.g. *Streptopelia orientalis erythrocephala*.

2. There is a general statement to the effect that the subspecies are not likely to be different from those of better worked adjoining areas, but the subspecific name is usually omitted

and the specific name used is followed by that of the original author, e.g. *Milvus migrans* (Boddaert). In polytypic species it is not customary to quote the author's name without naming the subspecies; this is particularly confusing in a list in which subspecific names are used. In the instance quoted, the correct name which is *Milvus migrans govinda* Sykes could be well mistaken for the nominate *Milvus migrans migrans* (Boddaert) (type locality France), found in western Pakistan and further westwards, or suggest that no subspecies are admitted.

This irregularity occurs under serial Nos. 1, 2, 3, 5, 6, 8, 10, 13, 16, 18, 19, 20, etc.

3. In the course of cataloguing the Bombay collection, attention has already been drawn to the difficulty/impossibility of separating some of the races upheld in INDIAN HAND-